

## Specification

Title of the invention

Plate transfer apparatus

Background of the invention

Field of the invention

The present invention relates generally to sheet-fed printing press, or more precisely, to plate transfer apparatus by which the used plate around the plate cylinder is ejected and new plate to be used is transferred to the cylinder.

Description of the prior art

In sheet-fed press by offset printing technique, ink and dampening water are supplied to the plate wound around the plate cylinder to form pictures which are then printed on the sheet by way of blanket cylinder.

In work switching of pictures to be printed, the used plate must be promptly ejected and also new plate to be used must be transferred efficiently to the plate cylinder. These are premises for automatic plate exchange.

In Japanese published unexamined patent specification No. 108525/1996, new plate casing is swingably provided in narrow space between printing units and new plate is transferred to the plate cylinder by plate exchange apparatus with complicated attitude control device and plate feeder.

Also in Japanese published unexamined patent specification No. 254645/1999, apparatus is disclosed which comprises plate passage with bent portion near the plate cylinder, sucker for transferring the plate and various check means for strictly checking plate transfer.

In Japanese patent specification No. 2941598, apparatus is disclosed with thin board which is swingable around an axis and the plate is guided by the this board.

The apparatus with swingable casing occupies broad space and its construction is extremely complicated. Also the apparatus with sucker and strict check device costs high in production due to its complicated structure. Moreover the apparatus with

turning axis obligates precise maneuvering and lacks swiftness in operation.

Nowadays, printing order has a tendency of so-called many sorts with small lot, consequently work exchange, namely plate exchange, is frequent. Thereafter, the apparatus for plate exchange shall be convenient in handling and be excellent in operation. In addition, the apparatus shall be small in its occupation and be easy in its process control, in consideration of adapting the apparatus not only to conventional series-type press, but also to satellite-type printing press in which printing units are provided in satellite-like manner around the common pressure cylinder. Moreover, high production cost hinders the apparatus from coming into use in printing press.

#### Summary of the invention

In view of the above-described problems of the prior art techniques, the present invention provides an improved plate transfer apparatus and aims at raising operativity in plate exchange process. The other objects are to reduce the occupied space and to facilitate the control of exchange process, so as to adapt the apparatus to satellite-type printing press. Further object is to simplify the construction, so as to lower the cost.

In accordance with the present invention, plate transfer apparatus comprises; transfer means which has functions, in its normal and opposite rotations, for ejecting the used plate outwards and feeding new plate to cylinder; flat sustaining board provided above the transfer means in order to prepare new plate, one end of the board is swingably supported and the other end is branched and; drive means for turning the sustaining board in order to sink the branched end into the transfer path of the transfer means.

The branched portion of the sustaining board is divided into comb-like shape. In addition, stopper for preventing reversion of the used plate as well as detecting means for detecting passage of the used plate on the stopper are provided on the way of ejection path of transfer means.

In ejection, the used plate is led from plate cylinder onto transfer means and, with normal rotation of transfer means, is ejected outwards after passing over the stopper and detecting means.

In feeding, sustaining board is turned by drive means and the branched portion sinks into the transfer path of transfer means.

Thereby, new plate prepared on the sustaining board goes onto the plate cylinder with opposite rotation of transfer means.

These and other objects of the invention will become apparent from the following

description with reference to the drawings. But, these show merely an embodiment of the invention.

#### Brief description of the drawings

Fig. 1 is a side section showing an embodiment of plate transfer apparatus according to the present invention.

Fig. 2 is a plan view showing left half of the apparatus.

Fig. 3 and under are explanatory views showing operations in order. Fig. 3 shows preparation of new plate and release of the used plate at its rear end.

Fig. 4 shows beginning of ejection by transfer means.

Fig. 5 shows release of the used plate at its front end.

Fig. 6 shows a state in which feeding of new plate begins, on the other hand, reversing of the used plate is prohibited.

Fig. 7 shows a state in which front end of new plate is clamped.

Fig. 8 shows a state in which new plate is completely attached and sustaining board is restored.

#### Description of preferred embodiment

Base (10) is a flat structure which composes the structural base of the apparatus and is combined to side frames (14) of printing press by way of proper bracket (12). From the front end ( Plate cylinder (16) side ) to the rear end ( Right side of figures. Operator side ) of the base (10), an endless belt (22) is stretched by a pair of conveyor rollers (18), (20). The endless belt (22) is rotated both in normal ( clockwise ) and opposite ( anti-clockwise ) directions by a motor (24) which drives the rear conveyor roller (20) in order to eject or feed the printing plate. Therefore, these endless belt (22), conveyor rollers (18), (20) and motor (24) compose transfer means (26) of printing plate.

As shown in Fig.2, a plurality of oblong holes (28) are provided in a row at the plate cylinder (16) side of base (10) and these holes (28) are dented from the surface of base (10). Above the transfer means (26), sustaining board (30) is provided on which new plate to be used is prepared. The sustaining board (30) is a plane member whose rear end is swingably combined to the axis (32) and has placement projections (34) of printing plate at front end and side ends.

Drive means (36) such as air cylinder is connected to the front end of sustaining board (30). ( Not to mention, drive means (36) itself is combined to base (10). ) Drive means

(36) works on and turns on sustaining board (30) around the axis (32), thereby the branched front end of sustaining board (30) sinks into oblong holes (28) of base (10).

On the way of plate ejection path of transfer means (26), spring-biased stopper (38) is provided which falls only in plate ejecting direction ( From plate cylinder (16) side to operator side, in other words, right direction of figures. ), so as only to allow ejection of the used plate and to prohibit reversing of the plate to the plate cylinder (16) direction . In order to detect passage of the used plate to be ejected on the stopper (38), detecting means (40) such as photo-electronic sensor is prepared near the stopper (38). Numerals (42), (44) and (46) indicate rollers to press on the plate.

Next, operation of above-said construction is described. As to the outline of plate cylinder (16), a pair of front end and rear end clamps are provided in a groove (48) which extends parallel to cylinder axis direction ( Perpendicular to Fig. 3). Both front and rear ends of plate are stretched by these clamps so as to closely attach it around the cylinder (16). The clamping apparatus can be done or released from outside. Such techniques are well known in the art by Japanese published unexamined patent specification No. 286111/1994 or so.

In Fig.3, new plate (50) to be used is prepared on the sustaining board (30) and, on the other hand, rear end of the used plate (52) is set free, as the plate cylinder (16) is rotated up to an appropriate degree and rear clamp (54) is released by actuator (56).

Rear end of the unclamped plate (52) is, as shown in Fig.4, led onto the transfer means (26) and plate ejection process begins with normal rotation ( clockwise rotation ) of transfer means (26). On the moment, also the plate cylinder (16) is rotated in normal direction and transfer roller (42) presses the used plate (52) onto the endless belt (22).

As shown in Fig.5, used plate (52) goes on with normal rotation of transfer means (26) and begins overriding the spring-biased stopper (38) on the way of transfer path. Then the used plate (52) is completely set free from plate cylinder (16), as front clamp (58) is released by an actuator (56).

Fig.6 is decidedly important to the invention. When tail end ( which was before front end ) of the used plate (52) passes over the stopper (38), it stands up again to prohibit reversing of the used plate (52) anymore. Thereafter, detecting means (40) detects passage of the used plate (52) on the stopper (38) and drive means (36) works on the sustaining board (30) to turn it around the axis (32). Thereby, the comb-like branched portion of sustaining board (30) sinks into oblong holes (28). At this moment, opposite rotation ( Anti-clockwise in Fig.6 ) of transfer means (26) begins. Although reversing of the used plate (52) is hindered by the stopper (38), new plate (50) goes on toward the plate cylinder (16) by endless belt (22). In other words, new plate (50) marches on the

opposite direction of ejection path of the used plate (52), also utilizing the same path.

Front end of new plate (50) is, as shown in Fig.7, clamped by front clamp (58) and new plate (50) is attached around the cylinder (16) with anti-clockwise rotation of it.

Finally as shown in Fig.8, rear end of plate is clamped by rear clamp (54) to complete the attachment of new plate (50). Drive means (36) restores to raise the sustaining plate (30) and the used plate (52) is removed by operator.

In plate transfer apparatus according to the present invention, the apparatus itself is fixed. Transfer means rotates both in normal and opposite directions in order to eject as well as feed the plate. New plate is led to the transfer path of transfer means by the turning of sustaining board.

Thereby, plate exchange can be carried out rapidly and precisely without particular skill. In addition, the apparatus costs low and can be adapted to satellite-type printing press.

The present invention is not limited to the embodiment described hitherto. Various changes and modifications can, of course, be made without departing from the spirit of the invention.

## Description of the reference numerals

10	base
16	plate cylinder
18	conveyor roller
20	conveyor roller
22	endless belt
24	motor
26	transfer means
28	oblong hole
30	sustaining board
32	axis
36	drive means
38	stopper
40	detecting means
50	new plate
52	used plate
54	rear clamp
58	front clamp